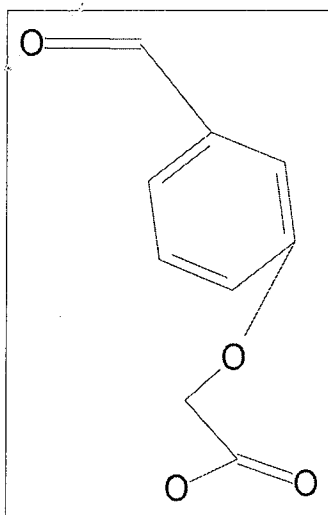


# EXHIBIT D



## Substance Identification

Beilstein Registry Number	<b>2048742</b>
Beilstein Preferred RN	37748-09-7
CAS Registry Number	37748-09-7
Chemical Name	(3-formyl-phenoxy)-acetic acid
Autoname	(3-formyl-phenoxy)-acetic acid
Molecular Formula	C <sub>9</sub> H <sub>8</sub> O <sub>4</sub>
Molecular Weight	180.16
Lawson Number	8629, 1771
Type of Substance	isocyclic
Constitution ID	1856203
Tautomer ID	1952560
Beilstein Reference	0-08-00-00060, 2-08-00-00054, 5-08, 6-08

## Field Availability List 1-6

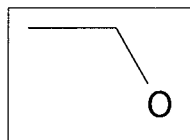
Code	Field Name	Occ.
<b><u>RX</u></b>	Reaction	17
<b><u>CDER</u></b>	Derivative	4
<b><u>CPD</u></b>	Crystal Property Description	1
<b><u>MP</u></b>	Melting Point	5
<b><u>IR</u></b>	IR Spectroscopy	1
<b><u>CNR</u></b>	Reference	16

## Reaction 1 of 17

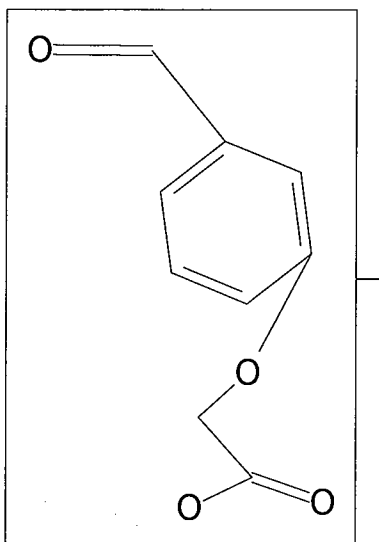
Reaction ID	<b><u>190141</u></b>
Reactant BRN	<b><u>1718733</u></b> ethanol
Product BRN	<b>2048742</b> (3-formyl-phenoxy)-acetic acid
No. of Reaction Details	<b><u>2109732</u></b> (3-formyl-phenoxy)-acetic acid ethyl ester
Reaction Classification	1
Reagent	Preparation
Find similar reactions	HCl
	<b><u>click here</u></b>

Note 1  
Ref. 1

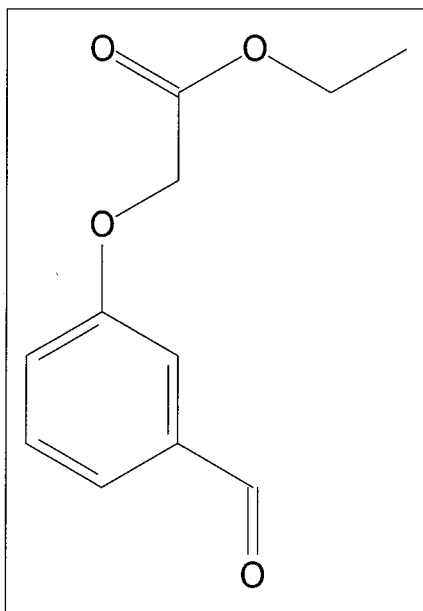
Handbook  
**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



Reactant 1



Reactant 2



Product 1

## Reaction 2 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Reagent

**309586**

**2048742** (3-formyl-phenoxy)-acetic acid

**2695071** 3-carboxymethoxy-benzoic acid

1

Preparation

alkali

water

permanganate

**[click here](#)**

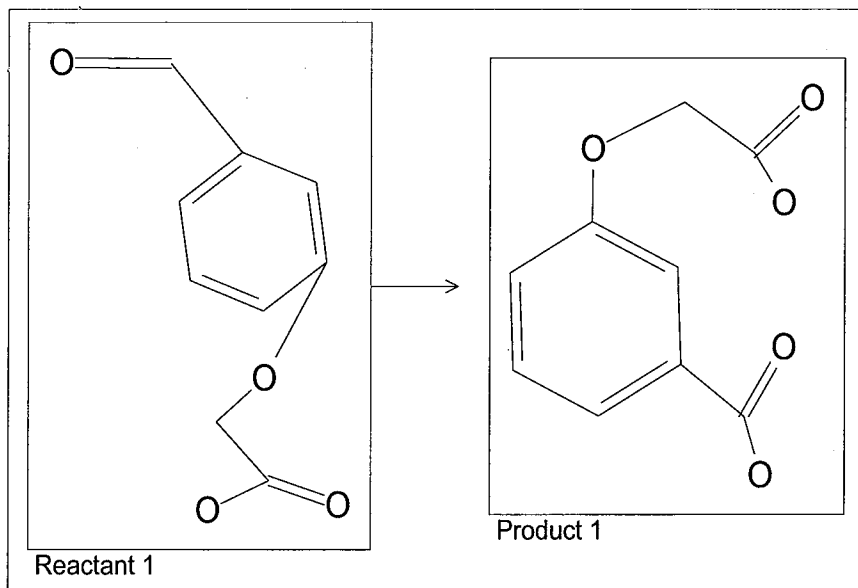
Find similar reactions

Note 1

Ref. 1

Handbook

**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



### Reaction 3 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Reagent

Find similar reactions

**558896**

**2048742** (3-formyl-phenoxy)-acetic acid

**385737** acetic acid anhydride

**3305754** 3-carboxymethoxy-cinnamic acid

1

Preparation

sodium acetate

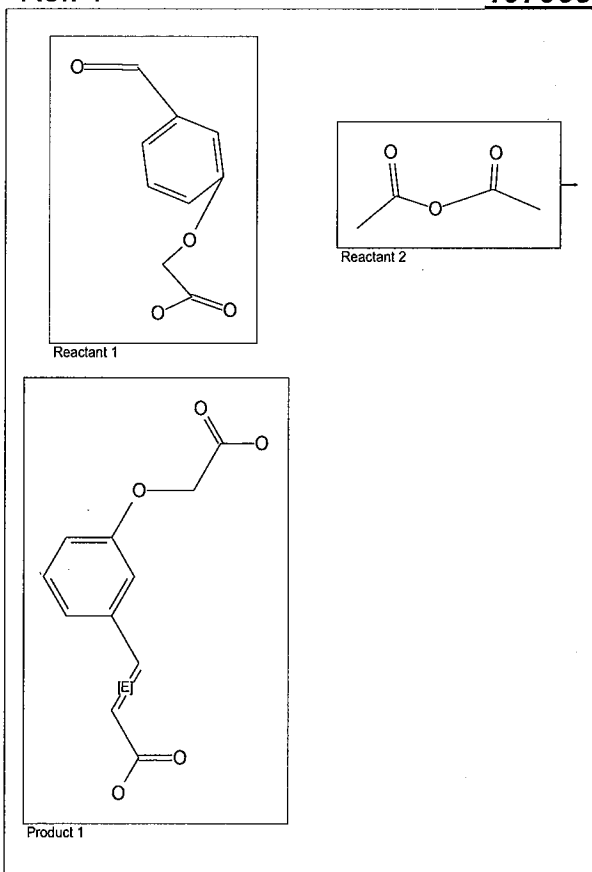
[\*\*click here\*\*](#)

Note 1

Ref. 1

Handbook

**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



## Reaction 4 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Reagent

Find similar reactions

**636552**

**2048742** (3-formyl-phenoxy)-acetic acid

**505984** acetaldehyde

**3279177** [3-(3-oxo-propenyl)-phenoxy]-acetic acid

1

Preparation

diluted NaOH-solution

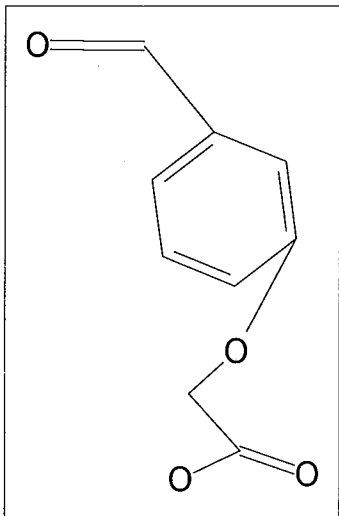
**[click here](#)**

Note 1

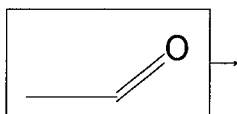
Ref. 1

Handbook

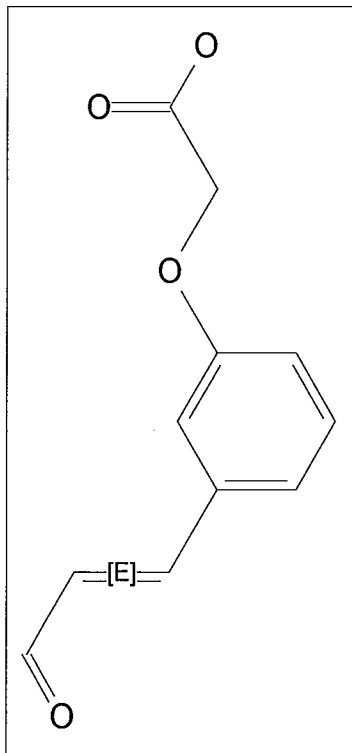
**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



Reactant 1



Reactant 2



Product 1

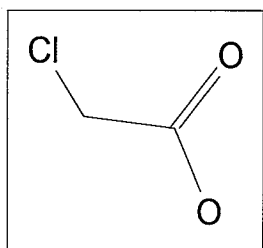
## Reaction 5 of 17

Reaction ID  
Reactant BRN

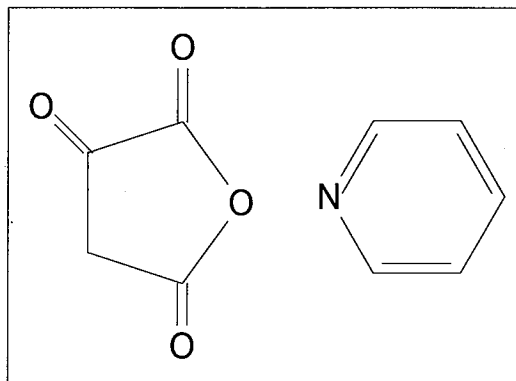
**660365**  
**605438** chloroacetic acid  
**5789338** Pyridinsalz des Oxymaleinsaeureanhydrids  
**507099** 3-hydroxy-benzaldehyde  
**2048742** (3-formyl-phenoxy)-acetic acid  
1  
Chemical behaviour  
[\*\*click here\*\*](#)

Note 1  
Ref. 1

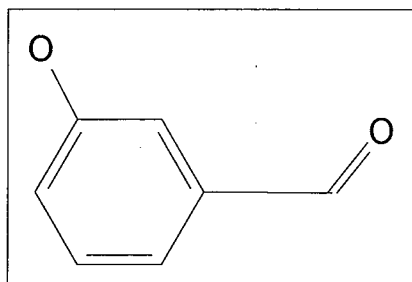
Handbook  
**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



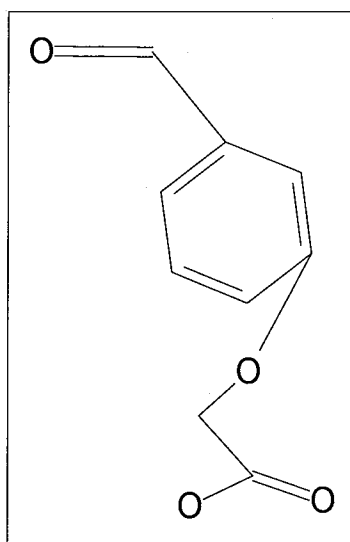
Reactant 1



Reactant 2



Reactant 3



Product 1

## Reaction 6 of 17

Reaction ID  
Reactant BRN

**660366**  
**507099** 3-hydroxy-benzaldehyde  
**605438** chloroacetic acid  
**2048742** (3-formyl-phenoxy)-acetic acid  
1  
Preparation  
NaOH-solution

Find similar reactions

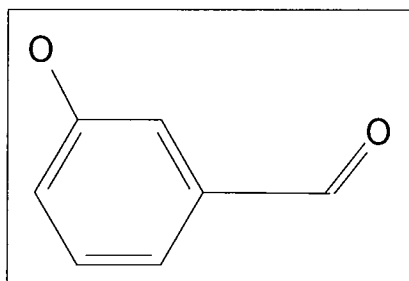
[click here](#)

Note 1

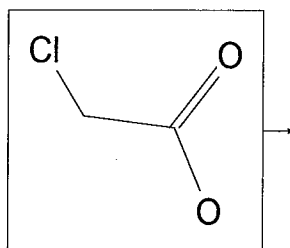
Ref. 1

Handbook

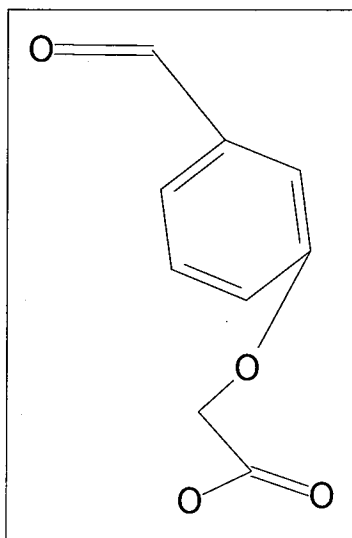
**1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.



Reactant 1



Reactant 2



Product 1

## Reaction 7 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Reagent

Find similar reactions

**2071867**

**5362023** C<sub>104</sub>H<sub>148</sub>F<sub>12</sub>O<sub>20</sub>

**2048742** (3-formyl-phenoxy)-acetic acid

**6173350** C<sub>140</sub>H<sub>172</sub>F<sub>12</sub>O<sub>32</sub>

1

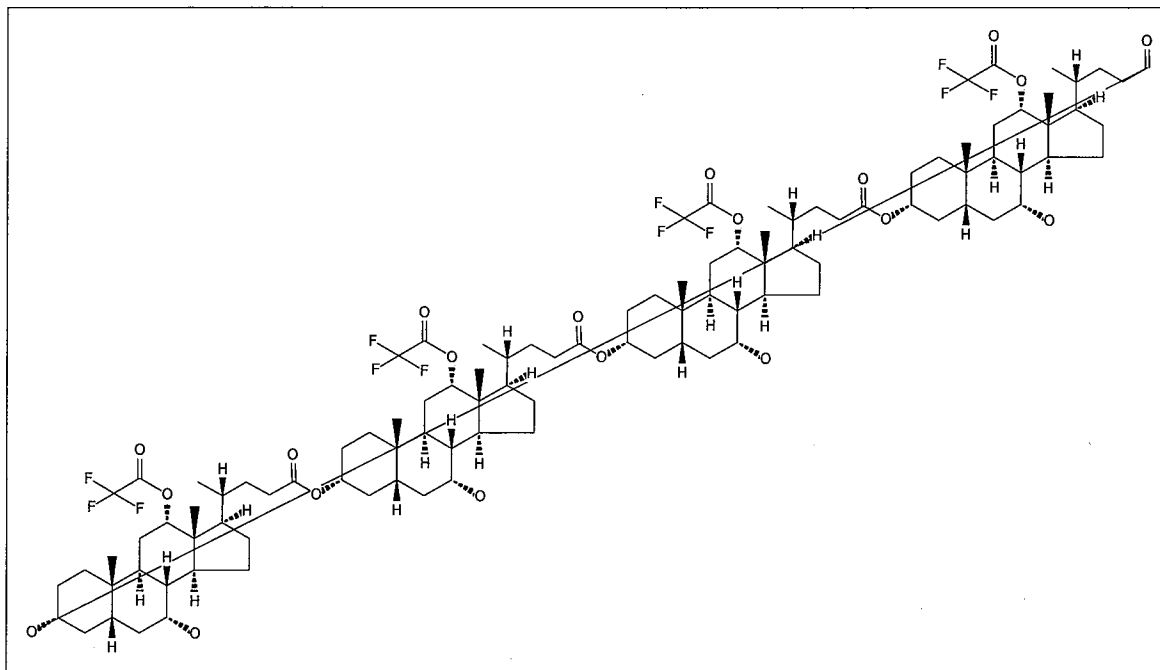
Preparation

dicyclohexylcarbodiimide, DMAP

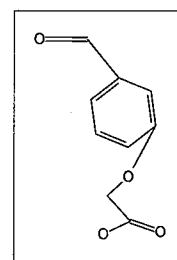
not available

Ref. 1

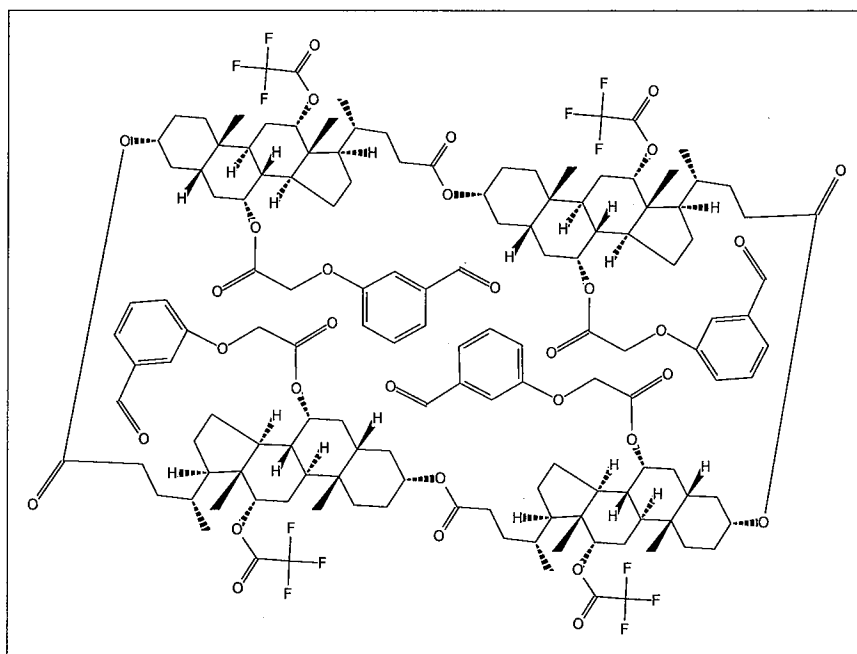
**5752565**; Journal; Bonar-Law, Richard P.; Mackay, Lindsey G.; Sanders, Jeremy K. M.; JCCCAT; J. Chem. Soc. Chem. Commun.; EN; 5; 1993; 456-458.



Reactant 1



Reactant 2



Product 1

## Reaction 8 of 17

Reaction ID  
Reactant BRN

**4228398**

**2048742** (3-formyl-phenoxy)-acetic acid

**506236** 1-nitro-propane

**1994538** [3-(2-nitro-but-1-enyl)-phenoxy]-acetic acid

1

Preparation

(i) nBuNH<sub>2</sub>, benzene, (ii) /BRN= 506236/, AcOH

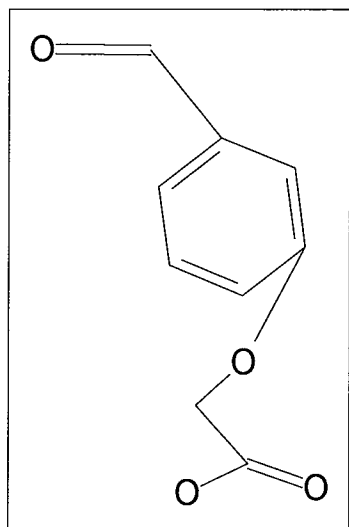
[\*\*click here\*\*](#)

Product BRN  
No. of Reaction Details  
Reaction Classification  
Other Conditions  
Find similar reactions

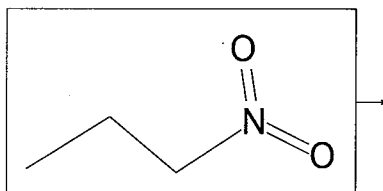
Note 1

Multistep reaction

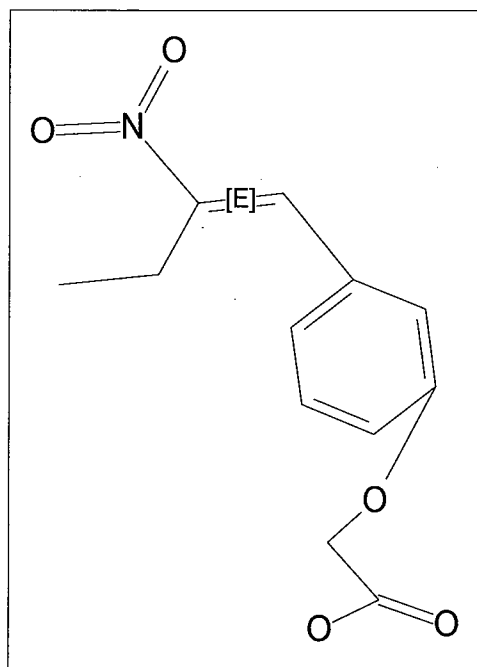




Reactant 1



Reactant 2



Product 1

## Reaction 9 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Reagent

Time

Find similar reactions

**4510213****2048742** (3-formyl-phenoxy)-acetic acid**1159** pyrrole**7564396** {3-[10,15,20-tris-(3-carboxymethoxy-phenyl)-porphyrinogen-5-yl]-phenoxy}-acetic acid

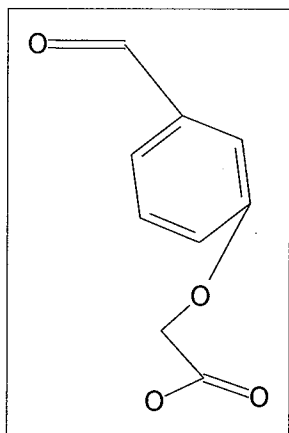
1

Preparation

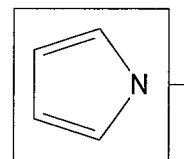
aq. sodium dodecyl sulfate, HCl

2 hour(s)

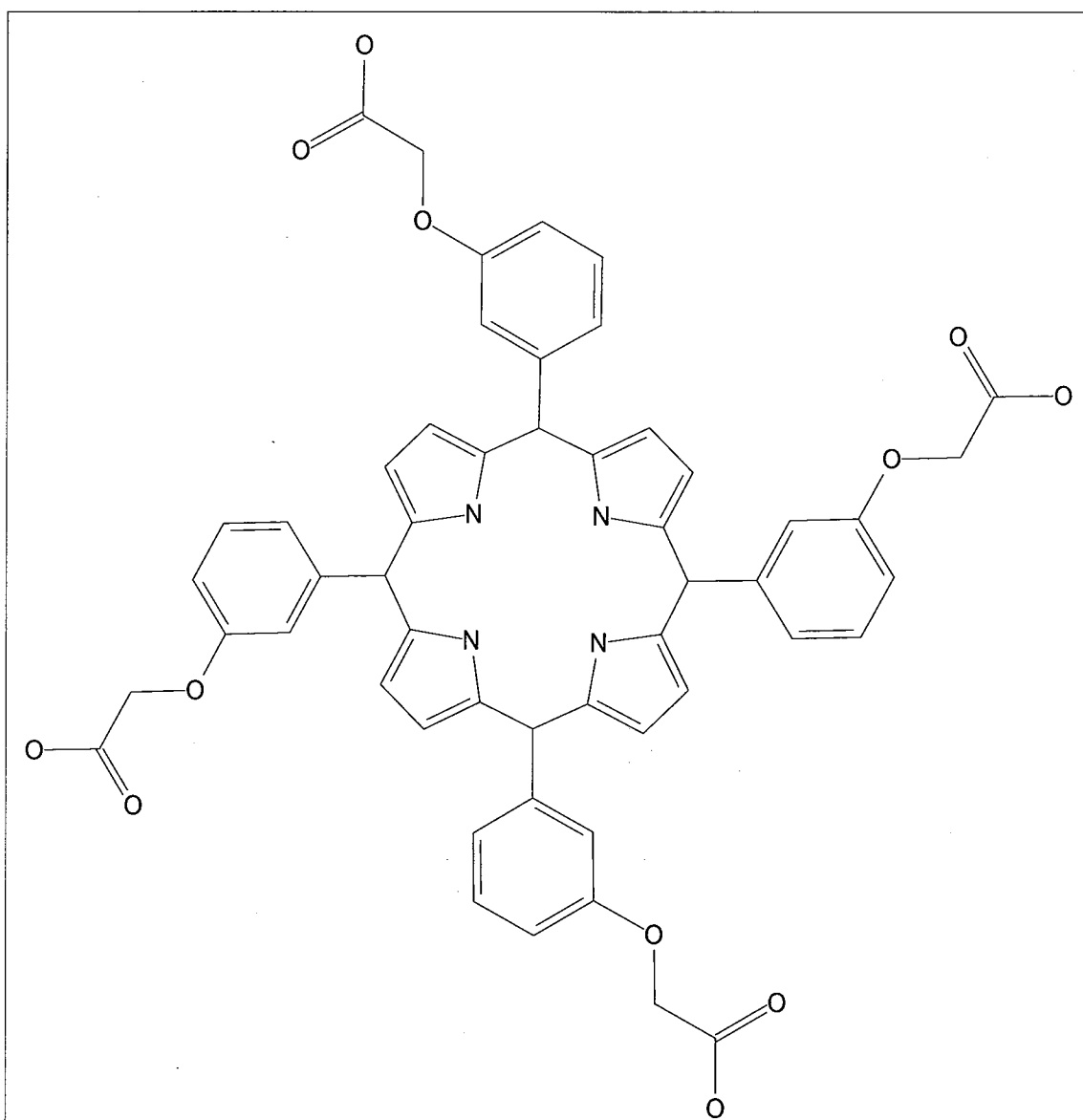
**[click here](#)**



Reactant 1



Reactant 2

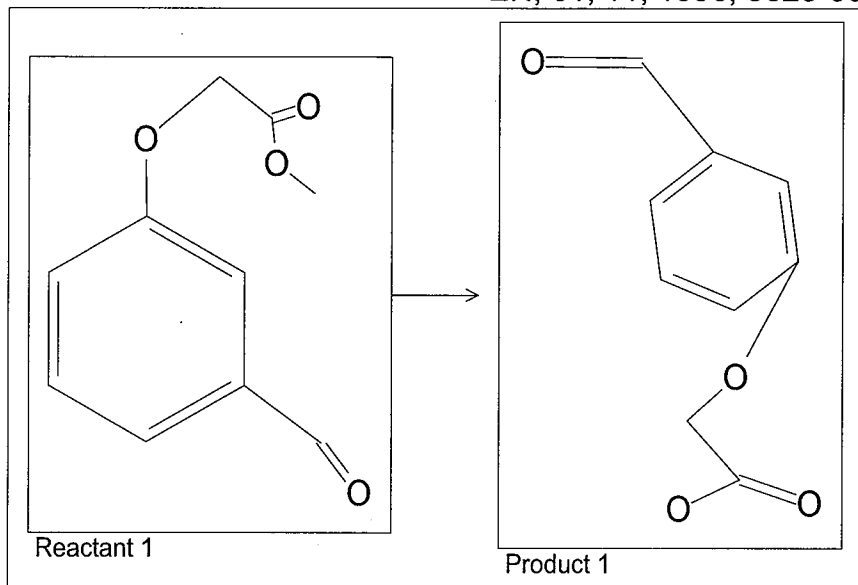


Product 1

## Reaction 10 of 17

Reaction ID **4517320**  
Reactant BRN **1960557** Methyl-m-formyl-phenoxyacetat  
Product BRN **2048742** (3-formyl-phenoxy)-acetic acid  
No. of Reaction Details 1  
Reaction Classification Preparation  
Reagent aq. KOH  
Solvent methanol  
tetrahydrofuran  
Find similar reactions [click here](#)

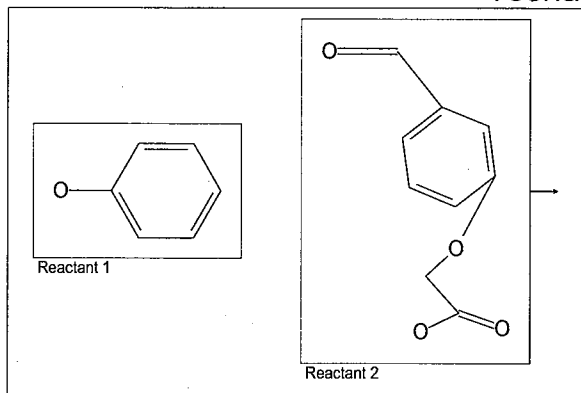
Ref. 1 **6021620**; Journal; Bonar-Law, Richard P.; JOCEAH; J. Org. Chem.; EN; 61; 11; 1996; 3623-3634.



## Reaction 11 of 17

Reaction ID **7149987**  
Reactant BRN **969616** phenol  
**2048742** (3-formyl-phenoxy)-acetic acid  
No. of Reaction Details 1  
Reaction Classification Chemical behaviour (half reaction)  
Other Conditions durch Kondensation  
Find similar reactions not available

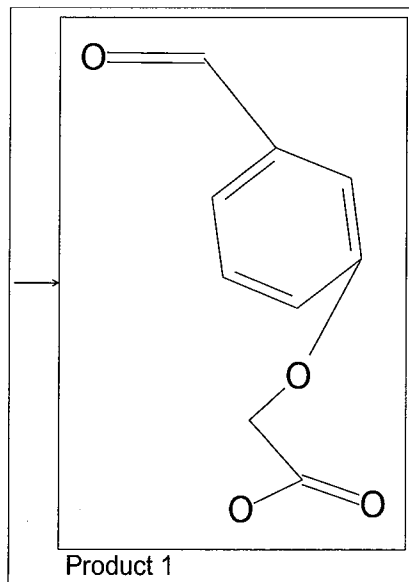
Note 1 Handbook  
Ref. 1 **1979953**; Patent; Hoechst Farb.; DE 362382; FTFVA6; Fortschr. Teerfarbenfabr. Verw. Industriezweige; DE; GE; 14; 1160.



## Reaction 12 of 17

Reaction ID	<b>7252880</b>
Product BRN	<b>2048742</b> (3-formyl-phenoxy)-acetic acid
No. of Reaction Details	1
Reaction Classification	Preparation (half reaction)
Find similar reactions	not available

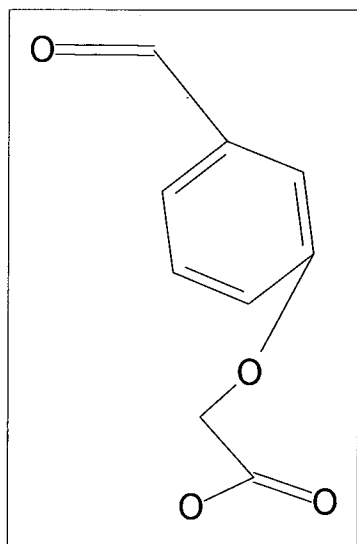
Ref. 1	<b>4068762</b> ; Patent; Biorex Lab. Ltd.; DE 2810253; 1978; Chem.Abstr.; EN; 90; 22628.
Ref. 2	<b>4084581</b> ; Patent; Ciba-Geigy; DE 2209128; 1972; Chem.Abstr.; EN; 78; 5413.
Ref. 3	<b>4162241</b> ; Journal; Krassowska et al.; PRCHAB; Przem. Chem.; 52; 1973; 741,742,743.
Ref. 4	<b>2893918</b> ; Patent; Upjohn; US 3944595; 1976; Chem.Abstr.; EN; 85; 176939.
Ref. 5	<b>2968330</b> ; Patent; Upjohn; US 3933895; 1974; Chem.Abstr.; EN; 85; 62726.
Ref. 6	<b>4384558</b> ; Patent; The Upjohn Co.; US 3933896; 1976; Chem.Abstr.; EN; 85; 32508.
Ref. 7	<b>3007991</b> ; Patent; Upjohn Comp.; US 3928417; 1975; Chem.Abstr.; EN; 85; 77744.
Ref. 8	<b>4171729</b> ; Patent; The Upjohn Co.; DE 2209990; 1972; Chem.Abstr.; EN; 78; 29477.



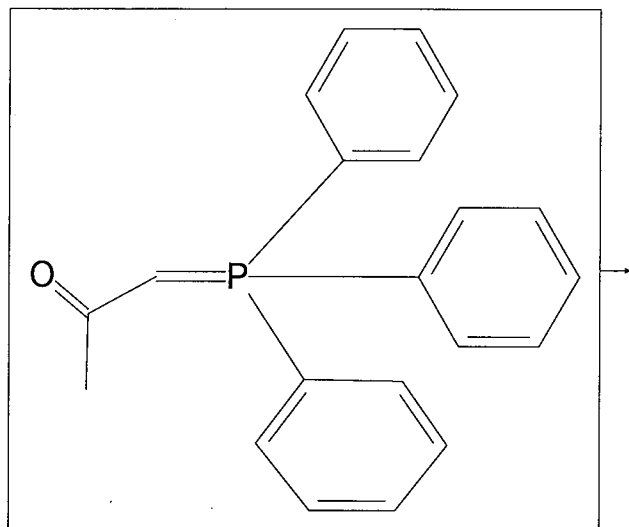
## Reaction 13 of 17

Reaction ID	<b>9811771</b>
Reactant BRN	<b>2048742</b> (3-formyl-phenoxy)-acetic acid
Product BRN	<b>750077</b> 1-(triphenyl- $\lambda^5$ -phosphanylidene)-propan-2-one
No. of Reaction Details	<b>9906109</b> [3-(3-oxo-but-1-enyl)-phenoxy]-acetic acid
Reaction Classification	1
Solvent	Preparation
Other Conditions	tetrahydrofuran
Find similar reactions	Heating
	<a href="#"><b>click here</b></a>

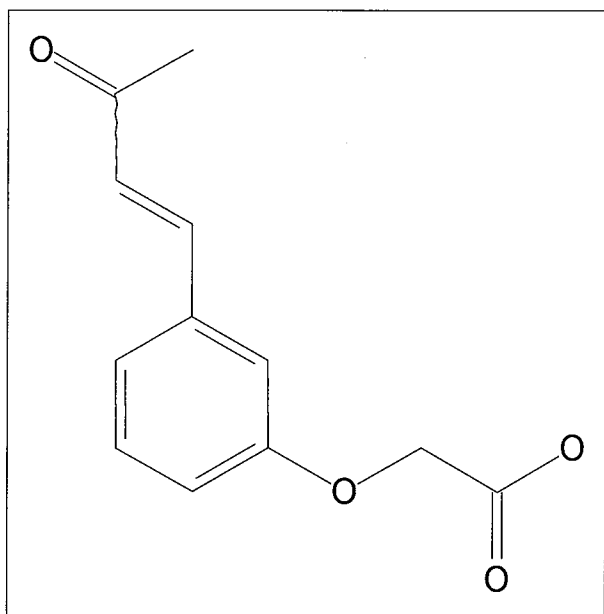
Ref. 1	<b>6486678</b> ; Journal; Acton, John J.; Black, Regina M.; Jones, A. Brian;
--------	--



Reactant 1



Reactant 2



Product 1

## Reaction 14 of 17

Reaction ID

**9968144**

Reactant BRN

**507099** 3-hydroxy-benzaldehyde

Product BRN

**506256** bromoacetic acid methyl ester

No. of Reaction Details

**2048742** (3-formyl-phenoxy)-acetic acid

Reaction Classification

1

No. of Stages

Multistage

Stage 1

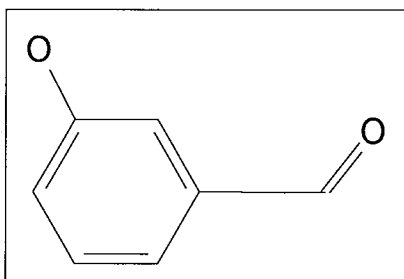
2

Stage 2

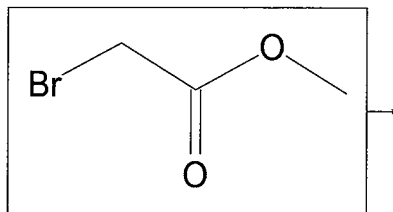
Reagent

sodium hydroxide

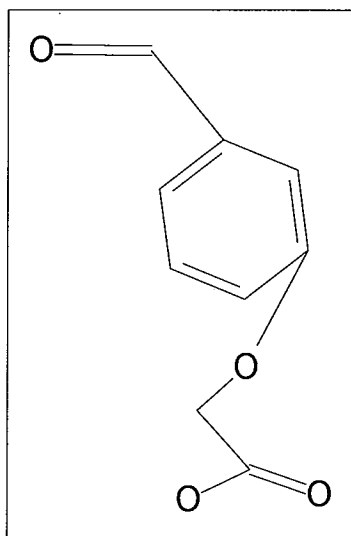
Ref. 1

**6502017**; Journal; Belokon', Yuri N.; Carta, Paola; North, Michael; TELEAY; Tetrahedron Lett.; EN; 46; 26; 2005; 4483 - 4486.

Reactant 1



Reactant 2



Product 1

**Reaction 15 of 17**

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

No. of Stages

Stage 1

Stage 2

Stage Reactant BRN

Find similar reactions

**9969154****2048742** (3-formyl-phenoxy)-acetic acid**1902903** Trimethylsilyldiazomethan**507066** propionic acid anhydride**4652394** hydrocyanic acid; potassium salt**10079086** propionic acid cyano-(3-methoxycarbonylmethoxy-phenyl)-methyl ester

1

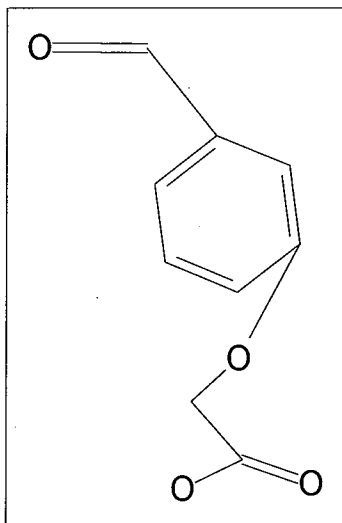
Multistage

2

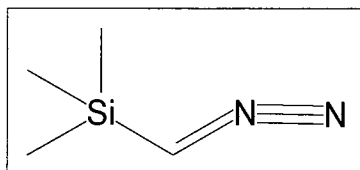
**507066** propionic acid anhydride**4652394** hydrocyanic acid; potassium salt[click here](#)

Ref. 1

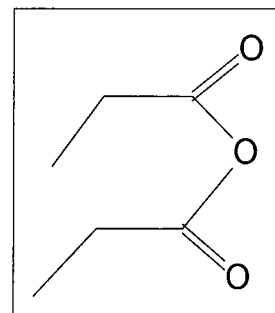
**6502017**; Journal; Belokon', Yuri N.; Carta, Paola; North, Michael; TELEAY; Tetrahedron Lett.; EN; 46; 26; 2005; 4483 - 4486.



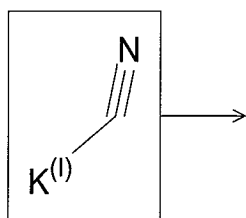
Reactant 1



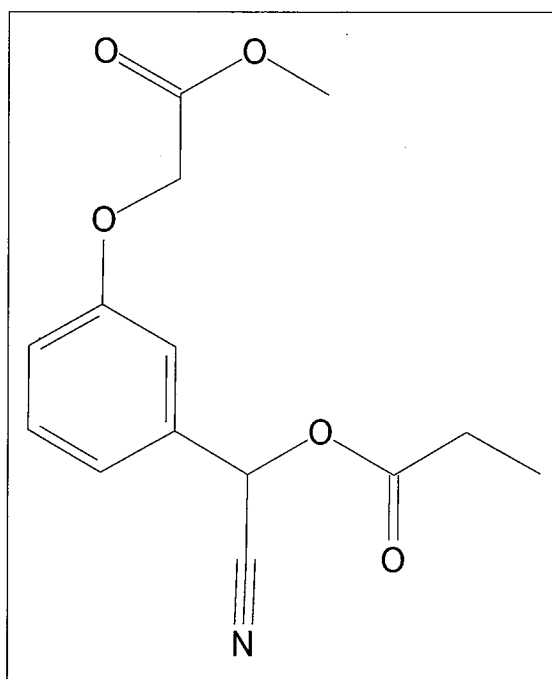
Reactant 2



Reactant 3



Reactant 4



Product 1

## Reaction 16 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Find similar reactions

**9969155**

**2048742** (3-formyl-phenoxy)-acetic acid

**507066** propionic acid anhydride

**1902903** Trimethylsilyldiazomethan

**4652394** hydrocyanic acid; potassium salt

**10082151** propionic acid cyano-(3-methoxycarbonylmethoxy-phenyl)-methyl ester

**10082152** propionic acid cyano-(3-methoxycarbonylmethoxy-phenyl)-methyl ester

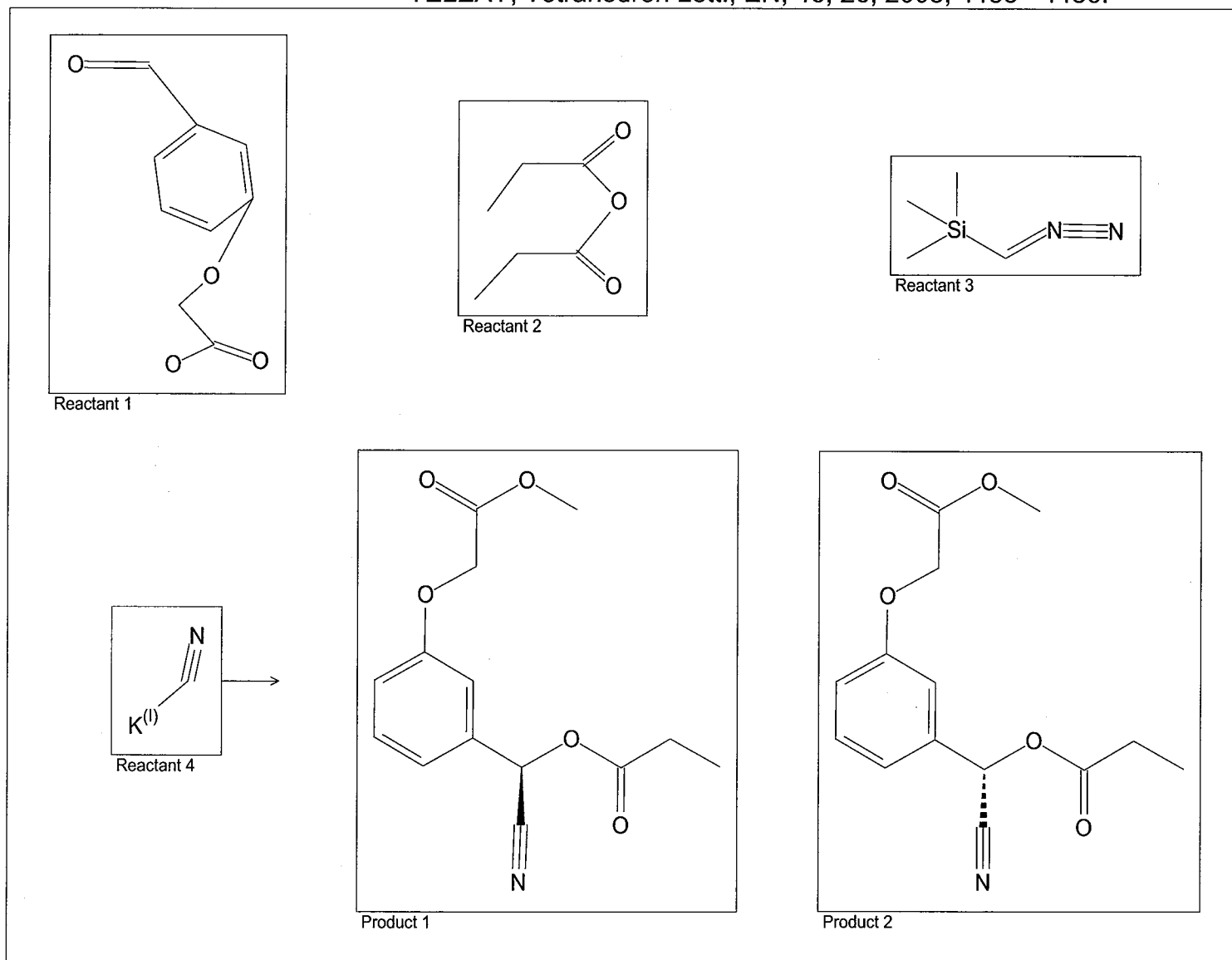
1

Preparation

[\*\*click here\*\*](#)

Note 1  
Ref. 1

Multistep reaction. Title compound not separated from byproducts  
**6502017**; Journal; Belokon', Yuri N.; Carta, Paola; North, Michael;  
TELEAY; Tetrahedron Lett.; EN; 46; 26; 2005; 4483 - 4486.



## Reaction 17 of 17

Reaction ID

Reactant BRN

Product BRN

No. of Reaction Details

Reaction Classification

Yield

Reagent

Solvent

Other Conditions

Find similar reactions

**10200266**

**195229** 1,3,6-trimethyl-5-nitro-1*H*-pyrimidine-2,4-dione

**2048742** (3-formyl-phenoxy)-acetic acid

**10375693** {3-[2-(1,3-dimethyl-5-nitro-2,6-dioxo-1,2,3,6-tetrahydro-pyrimidin-4-yl)-vinyl]-phenoxy}-acetic acid

1

Preparation

55 percent (BRN=10375693)

piperidine

dioxane

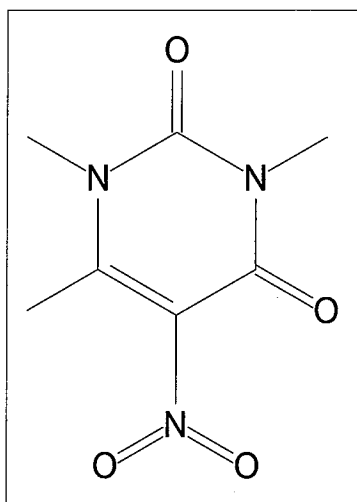
Heating

[\*\*click here\*\*](#)

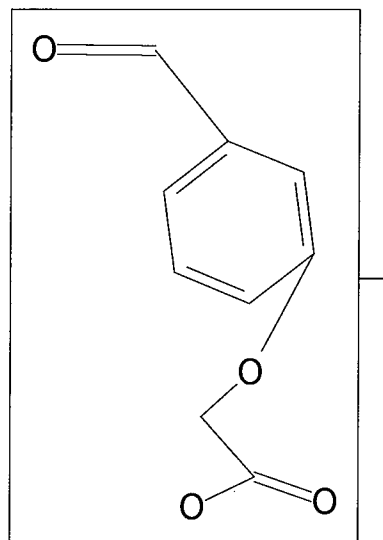
Ref. 1

**6562381**; Journal; Carotti, Angelo; Cadavid, Maria Isabel; Centeno, Nuria B.; Esteve, Cristina; Loza, Maria Isabel; Martinez, Ana; Nieto, Rosa; Ravina, Enrique; Sanz, Ferran; Segarra, Victor; Sotelo, Eddy;

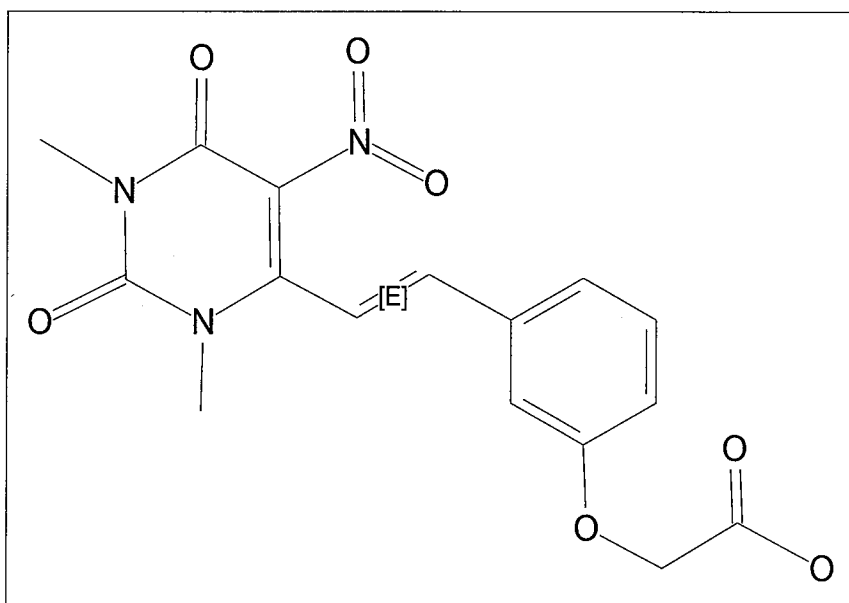




Reactant 1



Reactant 2



Product 1

## Derivative 1 of 4

Note 1  
Ref. 1

Semicarbazon: F:212-213.5grad (Zers.)  
**4162241**; Journal; Krassowska et al.; PRCHAB; Przem. Chem.; 52;  
1973; 741,742,743.

## Derivative 2 of 4

Note 1  
Ref. 1

Thiosemicarbazon: F:203-204grad  
**4162241**; Journal; Krassowska et al.; PRCHAB; Przem. Chem.; 52;  
1973; 741,742,743.

## Derivative 3 of 4

Note 1 2,4-Dinitrophenylhydrazon: F:251.5-252.5grad  
Ref. 1 **4162241**; Journal; Krassowska et al.; PRCHAB; Przem. Chem.; 52; 1973; 741,742,743.

## Derivative 4 of 4

Note 1 Ethylester: Kp(2):148-150grad  
Ref. 1 **4162241**; Journal; Krassowska et al.; PRCHAB; Przem. Chem.; 52; 1973; 741,742,743.

## Crystal Property Description

Colour & Other Properties Nadeln

Note 1 Handbook  
Ref. 1 **1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.

## Melting Point 1-5

VALUE (MP) C	Solvent (.SOL)	Entry Date	Note	Ref.
148 124 - 126 114 - 117 114 - 116 112.5 - 113.5	H2O		1	1 2 3-7 8 9

Note 1 Handbook  
Ref. 1 **1970630**; Journal; Elkan; CHBEAM; Chem. Ber.; 19; 1886; 3051.  
Ref. 2 **4068762**; Patent; Biorex Lab. Ltd.; DE 2810253; 1978; Chem.Abstr.; EN; 90; 22628.  
Ref. 3 **2893918**; Patent; Upjohn; US 3944595; 1976; Chem.Abstr.; EN; 85; 176939.  
Ref. 4 **2968330**; Patent; Upjohn; US 3933895; 1974; Chem.Abstr.; EN; 85; 62726.  
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